

Soil Transmitted Helminth Infection among Children Admitted to Hospital Tengku Ampuan Afzan, Kuantan, Pahang

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ABSTRACT

Introduction: Soil-transmitted helminth (STH) infections by *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms still persist in rural and urban areas of developing communities. Recent studies in Malaysia focused on Orang Asli communities and none in the hospital settings. This study aimed to investigate the prevalence and associated risk factors for STH among children admitted to Paediatric ward of the Hospital Tengku Ampuan Afzan (HTAA). **Materials and Methods:** This study was conducted among 135 (78 males, 57 females) patients in HTAA from December 2017 to May 2018. Faecal samples were examined using wet smear, Kato-Katz, Harada-Mori and sedimentation techniques. Demographic data and hygiene practice information were collected using a pre-tested questionnaire. **Results:** The overall prevalence of STH was 5.9% (*A.lumbricoides* 5.2%, *T.trichiura* 0.7%, and hookworms 0.7%). Prevalence among males was 3.8% and females 8.8%. Majority (95.6%) were Malays. Chi square analysis showed that factors significantly associated with STH infections are household monthly income ($p<0.05$), education level of mother ($p<0.05$) and father ($p<0.05$), the source of drinking water ($p<0.05$), the method of garbage disposal ($p<0.05$). Logistic regression analysis confirmed garbage disposal via burning as a risk factor of STH infections ($p= 0.021$, OR=23.8, 95% CI=1.6-350.06). **Conclusion:** This study shows that the prevalence of STH infections is low in children probably due to the effective implementation of control programs and good hygiene practice. Differences in individual lifestyles and the humid weather condition are probable reasons for sporadic infection to still exist.

KEYWORDS: *Ascaris*, *Trichuris*, Hookworms, Paediatrics, HTAA.

INTRODUCTION

Soil-transmitted helminths (STH) are a group of nematodes which include *Ascaris lumbricoides*, *Trichuris trichiura* and hookworms. They affect more than one billion people worldwide, particularly in rural communities of developing countries.¹ In 2010, 819 million people were reported to be

infected with *A.lumbricoides*, 438.9 million people were infected with hookworms, and 464.6 million were infected with *T.trichiura*.² STH are considered as one of the most important causes of physical and mental growth retardation in children.³

The highest prevalence of STH has been reported from Southeast Asia (SEA)² where one third of the population are infected.⁴ In Malaysia many early studies were conducted on intestinal parasitic infections (IPI), in particular STH infections as they were considered to be of medical importance. While vector-borne diseases such as malaria, filariasis and scrub typhus have declined over the years, IPI which is closely related to poor environmental condition and personal unhygienic practices, still causes major

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health problems among the indigenous Orang Aslis, plantation workers and rural populations.^{5,6}

Studies conducted on urban areas in Malaysia were mainly carried out among hospital patients, people from lower-middle class communities, and new villages inside urban municipalities that have better sanitation, health and medical services. Despite these improvements, the prevalence of STH was as high as 72.5% in 1977, and as low as 6.9% in 2005.⁶ The present study is aimed to add recent information on the prevalence of STH.

MATERIALS AND METHODS

This research is a cross-sectional study among patients admitted to Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang. Data was collected from December 2017 to May 2018. Subjects were selected randomly from patients admitted to the Paediatric ward of HTAA which is a public hospital. All related approvals were obtained for this study, i.e. NMRR (Research ID # 36392, NMRR-17-1229-36392), MREC, KRC and IREC.

Patients who were admitted were given a verbal briefing on the objectives and methodology of the study. Upon agreeing to take part in the study, they were asked to sign the informed consent form. For children above 12 years of age, both parents/guardians and the patients were asked to sign the consent form. As for children below 12 years, both consent and assent forms were signed by their parents/guardians. Confidentiality was maintained at all times. Through a guided interview, the subjects were requested to answer a pretested questionnaire prepared in Bahasa Malaysia which collected information on the demography, socio-economic status, and personal hygiene practices of the subjects.

Faecal samples were collected from subjects and macroscopic, direct wet mount and Kato-Katz preparation and examinations were carried out to detect the presence of STH.⁷ To detect light infection of hookworms, the Harada-Mori filter paper strip culture technique was performed.⁸ In this study, the dependent variable was the prevalence of STH infections among patients admitted to Paediatric ward of HTAA and the independent variables were age, gender, family

size, household income, education level of father and mother (of children), hygiene and environmental practices of the subjects/households.

Completed questionnaires and laboratory data were checked regularly to rectify any discrepancy, logical errors, and missing values. Initial data was recorded into an EpiData (version 4.2.0.0) data form and then exported to IBM SPSS Statistics version 22 for windows (SPSS Inc., Chicago, IL) for further analysis. Correlations analysis was carried out between individual characteristics and the presence of STH. All variables were categorical and the significance of their correlation was studied using chi-square (χ^2) analysis. Pearson's (χ^2) test on proportion was used to examine the crude associations between binary and independent variables. However, if 20% or more cells had expected count (EC) less than 5, Fisher's exact test was used. The level of statistical significance was set as $p < 0.05$. Moreover, binary logistic regression analysis was carried out to determine the independent association of variables with the dependent variable, i.e. STH. All variables with a significance level of $p \leq 0.25$ in the univariate analysis were chosen for multivariate analysis.⁹

RESULTS

A total of 135 subjects provided faecal samples which are used for calculations of the prevalence. Of these, 123 subjects provided faecal samples and completed the questionnaires and the data was used for investigation of associated risk factors. The age of the subjects ($n=135$) ranged from \square 1 year old to 14 years old with a mean of 2.47 ± 2.75 years; 86.7% were \square 5 years old. The number of male subjects was slightly higher (58%) than females (42%), with 95.6% of the study population being from the Malay ethnicity. Most of the subjects (85.7%) lived in Kuantan. Majority of the subjects (88.5%) had a household income of more than RM 1000 per month. Table I shows socio-demographic characteristics of the subjects.

Of the 123 subjects, 94.3% were using flush toilets located inside their houses. Nearly 87.0% of the households were using Municipality services for garbage disposals and 13.0% burnt their garbage. Only 14 (11.4%) subjects reported to eat soil (geophagia). Table II shows hygiene and environmental practices of the subjects.

Table I: Socio-demographic characteristics of the subjects

Characteristics	Frequency (%)	
Age (Years)*	2.47 ± 2.75*	
Age group	≤5 year	117 (86.7)
	≥5 Years	18 (13.3)
Gender (Male)	Male	78 (57.8)
	Female	57 (42.2)
Ethnicity	Malays	129 (95.6)
	Others	6 (4.4)
Residence	Kuantan	108 (85.7)
	Outside	18 (14.3)
Household number	≤ 5 members	79 (62.7)
	> 5 members	47 (37.3)
Household income (RM)	≤ 1000	14 (11.5)
	> 1000	108 (88.5)
Father's education	≥ 6 years (Educated)	112 (91.1)
	□ 6 years (Not educated)	11 (8.9)
	≥ 6 years	121 (98.4)
Mother's education	(Educated) □ 6 years (Not educated)	2 (1.6)
	Yes	112 (83)
Working fathers	No	11 (17)
	Yes	66 (53.7)
Working mothers	No	57 (46.3)

*Mean

The overall prevalence of STH was 5.9%, with *A.lumbricoides* being the most common (5.2%) helminth species, followed by hookworm (0.7%) and *T.trichiura* (0.7%). The infection rate was two times higher in females (8.8%) compared to males (3.8%).

Chi-square (bivariate) analysis showed some factors which were significantly associated with STH. Subjects with a household income of RM ≤ 1000/month had higher risk of getting STH than those with RM >1000 (p=0.048, OR=5.6, 95% CI=1.2-26.8). Children whose mothers were educated for less than 6 years had higher risk of getting STH compared to those who received education for ≥6 years (p=0.004). Children whose fathers were educated for less than 6 years had higher risk of getting STH compared to those who received education for ≥6 years (p=0.018, OR=9.3, 95% CI=1.8-46.9). Subjects who consumed unsafe drinking water (open well, river) had higher risk of getting STH compared to those consuming safe drinking water (tap, filter, mineral) (p=0.049, OR=9.3, 95% CI=1.4-61.0). Subjects whose households disposed

their garbage via burning had higher risk of getting STH than those households who used Municipality services for their garbage disposal (p=0.01, OR=8.6, 95% CI=1.9-38.8). Logistic regression analysis confirmed that garbage disposal via burning was a significant risk factor for STH (p=0.021, AOR=23.8, 95% CI=1.6-350.06).

Table II: Hygiene and environmental practices

Practices	Frequency (%)	
Source of drinking water	Tap water	61 (49.6)
	Filtered water	55 (44.7)
	Mineral water	2 (1.6)
	Hand pump	2 (1.6)
Defecation place	Open well and river	3 (2.4)
	Pour flush inside house	116 (94.3)
	Indiscriminate (Outside house, river side)	7 (5.7)
Washing hands after using toilet	Yes	71 (57.7)
	No	52 (42.3)
Trash disposal	Municipal	107 (87.0)
	Burning	16 (13.0)
Wearing footwear when going outside	Yes	89 (72.4)
	No	34 (27.6)
Eating soil (Geophagia)	Yes	14 (11.4)
	No	109 (88.6)
Washing hands after playing in soil	Yes	48 (39.0)
	No	75 (61.0)
Swimming habit	Regular	9 (7.3)
	Not regular	114 (92.7)

DISCUSSION

The overall prevalence of STH infection in children admitted to HTAA was found to be 5.9%. This is in agreement with a previous study conducted among members of the public in Kuala Lumpur in 2005 where the overall infection rate was found to be 6.9%.¹⁰

A.lumbricoides was the most prevalent helminth species in this study group (5.2%), followed by hookworm (0.7%) and *T.trichiura* (0.7%). This sequence of the STH is consistent with the global scenario,^{11, 12} and also a recent study in Malaysia.¹³ However, this is in contrast with some previous studies where *T.trichiura* was reported as the

leading species followed by *A.lumbricoides* and hookworm.^{3, 5, 14, 15} This is because it is more difficult to treat high worm burden with *T.trichiura* with a single dose of 400mg albendazole, as the worms are attached to the mucosa.¹⁴

No significant difference was found in the prevalence of STH with regard to subjects' gender and age groups and this is consistent with other studies.^{3,13, 16} The findings could not be categorized based on different ethnic groups, as the majority (95.6%) of the subjects were Malays. Lower education (<6 years) level of mothers was found to be significantly associated with STH in children. Lower level of mother's education has been identified as an important risk factor for polyparasitism in a recent study. This is perhaps less educated mothers have less health-related knowledge and concern attitude thus giving less health guidance to the children .¹⁶

Unsafe source of drinking water was a significant risk factor for STH which is similar to what was reported by Mohd-Shaharuddin *et al.* (2018)³ and Elyana *et al* (2016).¹⁶ Disposal of garbage via burning was found to be significantly associated risk factor for STH. This is in line with a study done by Lee *et al.*, (2014).¹⁴ The author however does not explain the reason behind this association. We postulate that garbage disposal via burning indicates poor garbage disposal management by the local authorities and low awareness by the community on environmental hygiene and personal hygiene. Hence these two factors may increase the risk of someone being infected with STH.

As the prevalence of STH among children admitted to HTAA was low, it probably shows the effective implementation of control programs carried out by the authorities and improved awareness about personal hygiene. Sporadic cases still persist probably due to poor individual hygiene practices and the humidity of the weather that permits the survival of organisms in the soil.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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